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ATTORNEY'S DOCKET NUMBER

**TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371**

2591-1-001

U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5)

09/856902

INTERNATIONAL APPLICATION NO.  
PCT/ES99/00381

INTERNATIONAL FILING DATE  
24 November 1999

PRIORITY DATE CLAIMED  
28 November 1998

**TITLE OF INVENTION**

**SYSTEM FOR CONTROLLING ELECTRIC MOTORS USED FOR THE PROPULSION OF A TRANSPORT TROLLEY**

**APPLICANT(S) FOR DO/EO/US**

**Francisco DÍAZ CARMENA; Ángel DÍAZ CARMENA**

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and the PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☒ has been transmitted by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - a. ☒ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☒ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
8. ☒ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☒ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

**Items 11. to 16. below concern other document(s) or information included:**

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.  
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information:

Four (4) Sheets of Formal Drawings; 1st Pg. of Published Application; International Search Report; Written Opinion; Response to Written Opinion or International Preliminary Examination Report; Translation of Application as originally filed

**EXPRESS MAIL "MAILING CERTIFICATE NO.": EL 758522795US      DATE OF DEPOSIT: MAY 25, 2001**

U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.50) <b>097856902</b>		INTERNATIONAL APPLICATION NO. PCT/ES99/00381		ATTORNEY'S DOCKET NUMBER 2591-1-001	
17. <input checked="" type="checkbox"/> The following fees are submitted:				<b>CALCULATIONS</b>	PTO USE ONLY
<b>Basic National Fee (37 CFR 1.492(a)(1)-(5)):</b> Search Report has been prepared by the EPO or JPO ..... \$860.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) ..... \$690.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) ..... \$710.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$1,000.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) ..... \$ 100.00 <div style="text-align: right; margin-top: 10px;"><b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b></div>				<div style="text-align: right; font-size: 1.2em;"><b>\$ 1,000.00</b></div>	
Surcharge of <b>\$130.00</b> for furnishing the oath or declaration later than months from the earliest claimed priority date (37 CFR 1.492(e)). <span style="float: right;"><input type="checkbox"/> 20 <input type="checkbox"/> 30</span>				<div style="text-align: right; font-size: 1.2em;"><b>\$</b></div>	
Claims	Number Filed	Number Extra	Rate		
Total Claims	10 -20 =	0	X \$18.00	\$ .00	
Independent Claims	1 -3 =	0	X \$80.00	\$ .00	
Multiple dependent claim(s) (if applicable)			+ \$270.00	\$ 270.00	
<b>TOTAL OF ABOVE CALCULATIONS =</b>				<b>\$ 1,270.00</b>	
Reduction for 1/2 for filing by small entity, if applicable.				\$ 635.00	
<b>SUBTOTAL =</b>				<b>\$ 635.00</b>	
Processing fee of <b>\$130.00</b> for furnishing the English translation later than months from the earliest claimed priority date (37 CFR 1.492(f)). <span style="float: right;"><input type="checkbox"/> 20 <input type="checkbox"/> 30</span>				\$	
<b>TOTAL NATIONAL FEE =</b>				<b>\$ 635.00</b>	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +				\$	
<b>TOTAL FEES ENCLOSED =</b>				<b>\$ 635.00</b>	
				Amount to be: refunded	\$
				charged	\$
<p>a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>635.00</u> to cover the above fees is enclosed.</p> <p>b. <input type="checkbox"/> Please charge my Deposit Account No. <u>11-1153</u> in the amount of \$ <u>        </u> to cover the above fees. A duplicate copy of this sheet is enclosed.</p> <p>c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account <u>11-1153</u>. A duplicate copy of this sheet is enclosed.</p> <p><b>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</b></p> <p>SEND ALL CORRESPONDENCE TO:</p> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div style="width: 45%;"> <p>DAVID A. JACKSON KLAUBER &amp; JACKSON 411 HACKENSACK AVENUE 4TH FLOOR HACKENSACK, NEW JERSEY 07601</p> </div> <div style="width: 45%; text-align: center;"> <div style="border-top: 1px solid black; width: 100%; margin: 5px auto;"></div> <p>SIGNATURE</p> <p>NAME</p> <p>DAVID A. JACKSON, REG. NO. 26,742</p> <p>REGISTRATION NUMBER</p> </div> </div>					
<p><b>EXPRESS MAIL "MAILING CERTIFICATE NO.": EL 758522795US      DATE OF DEPOSIT: MAY 25, 2001</b></p>					

PATENT  
2591-1-001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANTS : Francisco DÍAZ CARMENA and Ángel DÍAZ CARMENA  
APPLICATION NO. : PCT/ES99/00381  
FILED : November 24, 1999  
FOR : SYSTEM FOR CONTROLLING ELECTRIC MOTORS  
USED FOR THE PROPULSION OF A TRANSPORT  
TROLLEY

PRELIMINARY AMENDMENT

ASSISTANT COMMISSIONER FOR PATENTS  
BOX PCT  
WASHINGTON, D.C. 20231

Sir:

Prior to the entry into the National Phase of the above-identified Application, please  
amend the Specification as follows:

IN THE CLAIMS:

Please amend Claims 4 and 8 as follows:

4. (Amended) A system in accordance with claim 1, characterised in that the  
feedback circuit (5, 10) comprises a second preamplifier means (11) which amplifies the error  
signals (+II, -II).

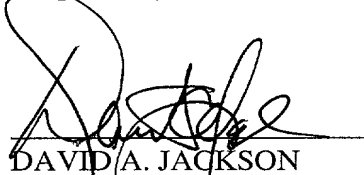
8. (Amended) A system in accordance with Claim 1, characterised in that the device  
propelled (13) is a mobile X-ray unit.

REMARKS

The above amendment is submitted herewith to reduce multiple dependencies and to  
conform the claims more closely to U.S. practice. In addition, the Specification has been

amended during International processing and certain of the pages thereof were revised and submitted as amended pages, which amended pages were accepted by the International Authority. To assure that the most current and accurate copy of the instant application is placed before the Examiner for substantive consideration, Applicants submit herewith a full copy of the International Application which includes all of the amendments made during International Phase. The changes made during International processing are believed to be appropriate and are not believed to raise the issue of new matter, and entry and favorable consideration and substantive examination thereof is accordingly requested.

Respectfully submitted,



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**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

Claims 4 and 8 have been amended as follows:

4. (Amended) A system in accordance with claim 1, [2 or 3,] characterised in that the feedback circuit (5, 10) comprises a second preamplifier means (11) which amplifies the error signals (+II, -II).

8. (Amended) A system in accordance with [any one of the previous claims] Claim 1, characterised in that the device propelled (13) is a mobile X-ray unit.

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09/856902  
JC18 Rec'd COMPTON 25 MAY 2001

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TITLE OF THE INVENTIONSYSTEM FOR THE CONTROLLED OPERATION OF A DEVICE  
PROPELLED BY ELECTRIC MOTORTECHNICAL FIELD OF THE INVENTION

5 The present invention lies within the technical field of devices propelled by an electromotive force and particularly in the sector of drive systems for electric trolleys and self-propelled devices.

STATE OF THE ART PRIOR TO THE INVENTION

10 At present, devices powered by electric motor, such as trolleys, fork-lifts or platforms for transporting loads, merchandise, pallets, crates, etc., jacks and self-propelled instruments like for example mobile X-ray units, find application in a plurality of industrial and  
15 commercial sectors.

Such devices are usually propelled by one or more drive wheels operated by electric motors, with the facility for the operator to select between functions of start/stop, forward/reverse movement and, in some cases,  
20 travelling speed. This type of device is handled by an operator standing on the floor who controls the direction and, where appropriate, the travelling speed by control means corresponding to the functions mentioned. The control means are usually situated on a lever or bar  
25 which, in order to direct the device to the left or to the right, is usually coupled to a frame or platform, having said frame or platform one or more wheels which turn freely and are swivel-coupled to the front or rear part of the body of the device, so that the displacing of  
30 the bar or lever to the right or to the left permits the device to be turned to the right or to the left.

These conventional devices, although very useful, have a number of drawbacks.

In this sense, a first drawback of the conventional  
35 devices is that by having the operations of turning to

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the right or to the left done by manually positioning the direction of the free wheels, the possibility of performing turns in confined spaces proves complicated. Furthermore, with this type of device, it also proves  
5 relatively complicated to move at an adequate speed and, consequently, for safe and precise handling, training in handling is necessary.

The European patent application EP 0 253 333 describes a control system for providing power to  
10 independently driven wheels of a power driven cart for transporting medical diagnostic equipment. A manually engageable handle is mounted to the cart in a position allowing a person to exert a manual force on the handle in a direction in which it is desired for the cart to  
15 move. Force sensors are coupled to the handle to sense the manual force applied to it in a plane parallel to the plane on which the cart is to be moved. The force sensors provide signals representative of the magnitude and direction of the manual force applied to the handle in  
20 forward, reverse and turning directions. Electronic circuits are coupled to the force sensors for providing control signals to motors driving the wheels of the cart for independently controlling direction and velocity of movement of the cart.

25 The features known in combination from this European patent are placed in the preamble of independent claim 1.

#### OBJECT OF THE INVENTION

The object of the present invention is to overcome the drawbacks mentioned above by means of a system which  
30 permits the controlled operation of a device propelled by electric motor, which is easy to handle without any need for intensive training, which can turn in confined spaces and which, in spite of being an active motorised element, behaves with a certain pasiveness which translates into a  
35 sensation of heaviness for the operator which contributes

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to the operator's handling of the device being intuitive, very precise, easy and quick.

#### DESCRIPTION OF THE INVENTION

5 In accordance with the invention, the aforementioned objects are achieved by means of a system for the controlled operation of a device propelled by an electric motor which comprises at least two drive wheels fitted at opposite ends of an axle, propelled by electromotive means, and control means for governing the propulsion of  
10 the drive wheels, in which each drive wheel is propelled by an independent electric motor and in that each electric motor is provided with independent control means. In accordance with the invention, these control means for each electric motor comprise an independent  
15 power amplifier which amplifies electrical signals produced by sensor means, and feeds electric power to the electric motor. The sensor means detect the mechanical force of pushing and pulling applied to a push and pull element by a user, and transforms said mechanical force  
20 into electrical signals indicating the degree of the force (e.g. strong, very strong or weak) at the direction (forward or backward) of the mechanical force applied in said push and pull element. The amplifier amplifies the signals in accordance with an amplification factor in  
25 terms of the weight of the device, and feeds the electric motor so that it powers the drive wheel in accordance with a torque corresponding to the movement ordered by the sensor means. The sensor means which order each electric motor can be operated separately in such a  
30 manner that each drive wheel can be propelled selectively.

In a preferred embodiment of the invention, the system comes with two wheels each propelled by its own electric motor as well as with first control means for  
35 the first electric motor and second independent control



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means for the second electric motor. In accordance with this embodiment, the first control means comprises first sensor means required by a first push and pull means, and the second control means comprises second sensor means  
5 required by a second push and pull means. Preferably, the first and the second push and pull element, are interconnected through a connecting element coupled in such a manner that pulling or pushing the connecting element by the user can act selectively on the first or  
10 the second push element.

In a preferred embodiment of the invention, the connecting element is a handle whose extremities act respectively on the respective push and pull elements, which in turn act on the respective sensors. With this  
15 arrangement, it is achieved that, by pushing or pulling the handle, the operator is able to manoeuvre in an especially easy and comfortable manner. Thus, when the handle is situated at the rear of the device and the operator wishes to start to move forwards, he has only to  
20 grasp the handle with both hands, one on the left part of the handle and the other on its right part, and push it with the same force by both hands. In this manner, the extremities of the handle shall apply the same pressure on the two sensors which shall transmit the electrical  
25 signals corresponding to their respective control means so that both electric motors operate at the same speed. When the operator wishes to turn to the right, he pushes the handle more firmly in his left hand, so that the control means on the left side order the electric motor  
30 on the left to rotate at a greater speed than that on the right and, consequently, the left drive wheel turns more quickly than the right one and, if it is wished to turn to the left he pushes more firmly in his right hand in which case the control means of the right side and,  
35 consequently, the right side electric motor and the right

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drive wheel work in a way as the described above with respect to the manoeuvre of turning to the right. When the operator wishes to start to reverse, he pulls the handle instead of pushing it, in the same way as the  
5 described before with respect to moving forwards.

When the operator wishes to turn the device around, he pushes the handle with the opposite hand to that of the turning direction and simultaneously he pulls the handle with his other hand. In this case, the motor and, consequently, the drive wheel of the side on which the operator pulls the handle rotates backwards whereas the drive wheel on the side on which the operator pushes the handle rotates on the opposite direction, thereby making it possible for the device to turn around completely.  
10

Likewise, the operator can select the travelling speed by simply pushing or pulling the handle with variable strength.  
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In a preferred embodiment of the system of the invention each of the control means also comprises first preamplifier means which amplifies the electrical signals produced by the sensor means as a function of the pushing or pulling force detected, which feeds preamplified signals to the power amplifier which supplies the drive wheel. In this preferred embodiment, it is also especially beneficial that each of the control means comprises also for each power amplifier, a feedback circuit which compares, by comparator means, the true value of electric power supplied to the electric motor with the pre-established value of electric power necessary to achieve movement of the of the drive wheel, and transforms the difference detected -which arise for example when the drive wheel is on a ramp sloping upwards or downwards- between the true value and the pre-established value, into error signals by means of which  
20  
25  
30  
35 the input electrical signals to the power amplifier are

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altered in order that the latter supply the necessary power to the electric motor for it to rotate on a basis of the torque required to perform the movement ordered by the sensor means. In this manner it is achieved that the unevenness of the surface over which the device is travelling is automatically offset insofar as its possible effect on the motion of the device is concerned, and the movement is therefore uniform. Appropriately, each feedback circuit comprises a second preamplifier means which amplifies the error signals.

In an especially preferred embodiment of the system of the invention, the latter is incorporated into a mobile X-ray unit. It is well known these units are very heavy (400-600 kg, usually) and have to be capable of being manoeuvred often in very confined spaces, by personnel not accustomed to handling this type of apparatus frequently.

According to the invention, the amplification factor applied to the power amplifier is calculated so that a relation is maintained between the weight of the propelled device and the application of a reasonable force on the push and pull elements by the user.

As sensors for detecting the pushing or pulling force applied by the operator, use can be made of load cells (like for example extension-measuring gauges), pressure detectors, and also piezoelectric, optical, magnetic, capacitive and resistive sensors.

As power amplifiers use can be made of standard instrumentation amplifiers and preamplifiers for the input signals, such as those marketed by the company ANALOGUE DEVICE.

#### DESCRIPTION OF THE DRAWINGS

The invention is described hereunder on the basis of an embodiment shown in the drawings attached hereto which form an integral part of this descriptive

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specification, in which:

figure 1 shows a schematic block diagram which shows the basic electronic and electrical elements of the system of the invention in an embodiment applied to a device propelled by two drive wheels;

figure 2 shows a schematic block diagram, corresponding to figure 1, of the basics elements related with the control of the left side drive wheel;

figure 3 shows a schematic plan view of the most significant components of the system in the embodiment illustrated in figure 1;

figure 4 is a schematic view of the disposition the handle, the left side force sensor and the left side push and pull element, shown in figure 3;

#### 15 DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

As can be appreciated from figure 1, the system comprises a force sensor 1 which detects the mechanical force of pushing, +FI, or pulling, -FI, applied by the operator, and transmits signals indicating the forces detected to the power amplifier 2. The amplifier 2 amplifies the signal by a factor KI and supplies the resulting electric power to the left, direct current motor 3, which powers the left drive wheel 4. A feedback circuit 5 which measures the motor current which is proportional to the torque, detects any difference between the nominal value and the true value and generates, in the event of there being differences between these values, an error signal which is applied to the amplifier 2 in addition to the signal received from the force sensor 1. Figure 1 also shows the layout of the elements for controlling and propelling the right wheel, comprising the right force sensor 6 which detects the pushing +FD, or pulling forces, -FD, applied by the operator, the right amplifier 7, the right electric motor 8, the right drive wheel 9 and the right feedback circuit

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10. For the propulsion of the left wheel an entirely similar layout of elements is provided.

5 It can be appreciated from figure 2 that the left side feedback circuit 5 comprises a preamplifier 11 for the error signal and another preamplifier 12 for the signal received from the force sensor 1. The layout shown in figure 2 for the left side is entirely similar to the layout of elements on the right side (not shown in figure 2).

10 Figure 3 shows the physical layout of:  
- the force sensors 1, 6 comprising extension-measuring gauges (VISHAY) 1a, 6a,  
- the electric motors 3, 8,  
15 - the drive wheels 4, 9 in a mobile X-ray unit 13,  
- the push and pull elements 14, 15 comprising spring metal bands, anchored in respective fasteners 16, 17 of the unit 13 framework, said push and pull elements being joined to each other, at their outside extremities, by means of a handle  
20 18.

It can also be appreciated that, in the embodiment shown in figure 3, the power supply is a set of rechargeable batteries 19.

25 Figure 4 shows in greater detail the layout of the force sensor 1a, of the push and pull element 14 and of its fastener 16, as well as of the handle 18.

From figures 3 and 4 it can be deduced that when the user pulls or pushes the handle 18, this results in a forward or backward spring deformation of the band corresponding 14, 15, which deformation is detected by the respective extension-measuring gauge 1a, 6a and converted into an electrical signal in accordance with that explained above. Due to the flexibility of the bands 14, 15, when the user is not pushing or pulling the  
30 handle, released either intentionally or accidentally,  
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the bands return to their stop position and, as a result, the motion of the unit is halted.

The embodiment illustrated in the figures can be applied, by way of example, to a self-propelled mobile X-ray unit, of approximately 400 kg in weight. In this case use can be made of two GSC electric motors 3, 8, each with a power of 500 W and a torque of 15 Nm, two ANALOGUE DEVICE power amplifiers, each of 500 W, which incorporate the preamplifiers 11, 12 of the left feedback circuit 5 and the preamplifiers (not shown) of the right feedback circuit 10. To provide the user with a sensation of heaviness which permits him to push and pull the unit with greater security, it has been calculated that he should apply a force, in respect of each hand, of between 0 (= stopped) and 4 kg when pushing +FI, +FD, or pulling -FI, -FD, detectable by the force sensors 1, 6. The power amplifiers 2, 7, multiply these pushing or pulling forces by factors KI, KD which can be set for example in 11 and feed the corresponding power to the electric motors 3, 8 so that they can propel the wheels 4, 9 with the necessary forces +KIFI, -KIFI, +KDFD, -KDFD. When the operator is moving the unit on a downward slope and is pushing with maximum force of 4 kg, this implies the unit will be travelling at the maximum attainable speed. When moving the unit over a flat floor or on an upward slope, the maximum speed is reduced in order to achieve a greater drive force. Depending on the force applied, the operator can therefore regulate the travelling speed over each surface.

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A M E N D E D   C L A I M S

1.- A system for the controlled operation of a device propelled by electric motor,

5    said system comprising,

          at least two drive wheels mounted in an axially opposed manner, equipped with control means to govern the propulsion of the drive wheels, wherein each drive wheel (4, 9) is propelled by an independent electric motor (3, 8) and independent control means provided for each electric motor, said control means comprising

          an independent power amplifier (2, 7) which amplifies electrical signals produced by sensor means (1, 1a, 6, 6a), and supplies electric power to the corresponding electric motor (3, 8);

          sensor means (1, 1a, 6, 6a) for detecting a mechanical force (+FI, -FI, +FD, -FD) of pushing (+FI, +FD) and pulling (-FI, -FD) applied to a push and pull element (14, 15) by a user, and transforming said mechanical force (+FI, -FI, +FD, -FD) into electrical signals that indicate the degree and the direction of the mechanical force applied on said push and pull element (14, 15),

          said sensor means (1, 1a, 6, 6a) capable of being operated separately in such a way that each drive wheel (4, 9) is powered selectively

characterised in that,

          the amplifier (2, 7) amplifies the signals in accordance with an amplification factor (KI, KD) as a function of the weight of the device (13) and supplies the electric motor in order that it propel the drive wheel (4, 9) in accordance with a torque corresponding to the movement ordered by the sensor

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means (1, 1a, 6, 6a) where each one of the control means comprises in addition for each power amplifier (2, 7), a feedback circuit (5, 10) which compares, by means of a comparator means, the true value of the electric power fed to the electric motor with the pre-established nominal value of the electric power needed to achieve movement of the drive wheel, and transforms differences detected between the true value and the pre-established value into error signals (+II, -II, +ID, -ID) by means of which the electrical input signals to the power amplifier are altered in order that the latter supply the necessary power (+KIFI, -KIFI, +KDFD, -KDFD) to the electric motor (3, 8) in order that it can rotate on basis of the torque needed to produce the movement ordered by the sensor means (1, 1a, 6, 6a).

2. A system in accordance with claim 1, characterised in that it has at least a first and a second electric motor (3, 8) as well as a first independent control means for the first electric motor (3) and a second independent control means for the second electric motor (8), the first control means comprising a first sensor means (1, 1a) required by a first push and pull element (14), and the second control means comprising a second sensor means (6, 6a) required by a second push and pull element (15).

3. A system in accordance with claim 1 or 2, characterised in that each one of the control means also comprises a first preamplifier means (12) which amplifies the electrical signals produced by the sensor means (1, 1a, 6, 6a) as a function of the pushing or pulling force detected (+FI, -FI, +FD, -FD), which applies preamplified signals to the power amplifier (2, 7) which feeds the drive wheel.



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4. A system in accordance with claim 1, 2 or 3, characterised in that the feedback circuit (5, 10) comprises a second preamplifier means (11) which  
5 amplifies the error signals (+II, -II).

5. A system in accordance with claim 2, characterised in that the first and the second push and pull elements (14, 15) which are connected to the first and second  
10 force sensors (1, 1a, 6, 6a), are coupled to each other through a connecting element (18), said coupling being in such a manner that the pulling or pushing of the connecting element (18) by the user can act selectively on the first (14) or the second (15) push element.

15 6. A system in accordance with claim 5, characterised in that the first and second push and pull elements (14, 15) connected to the first and second force sensors (1, 1a, 6, 6a), and the connecting element (18), configure an  
20 assembly formed by a handle.

7. A system in accordance with claim 5 or 6, characterised in that the push and pull elements (14, 15) are formed by bands whose first extremities are coupled  
25 to the connecting element (18) and whose second extremities are held immobile in fasteners (16, 17), and in that the first and second force sensors (1, 1a, 6, 6a) are extension-measuring gauges (1a, 6a) arranged on the bands (14, 15) in such a manner that when the connecting  
30 element is pushed or pulled, a deformation arises in the corresponding band (14, 15), said extension being detected by the pertinent gauge (1a, 6a).

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8. A system in accordance with any one of the previous claims, characterised in that the device propelled (13) is a mobile X-ray unit.

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A B S T R A C T

SYSTEM FOR THE CONTROLLED OPERATION OF A DEVICE  
PROPELLED BY ELECTRIC MOTOR

5 A system is described for the controlled propulsion  
of a transporting device comprising at least two drive  
wheels propelled by electromotive means, in which system  
at least two drive wheels are each propelled by  
independent electric motors; each electric motor receives  
electric power through an independent power amplifier  
10 which amplifies electrical signals produced by sensor  
means; the sensor means detect a mechanical force applied  
on a push and pull element, and convert said mechanical  
force into electrical signals which indicate the degree  
and the direction of the mechanical force applied on said  
15 push and pull element; and the amplifier amplifies the  
signal in accordance with a factor which is a function of  
the weight that the trolley has to move and it feeds the  
electric motor so it can power the drive motor in  
accordance with a torque corresponding to the movement  
20 ordered through the sensor means.

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T05780-20695860



TESTED 20695860

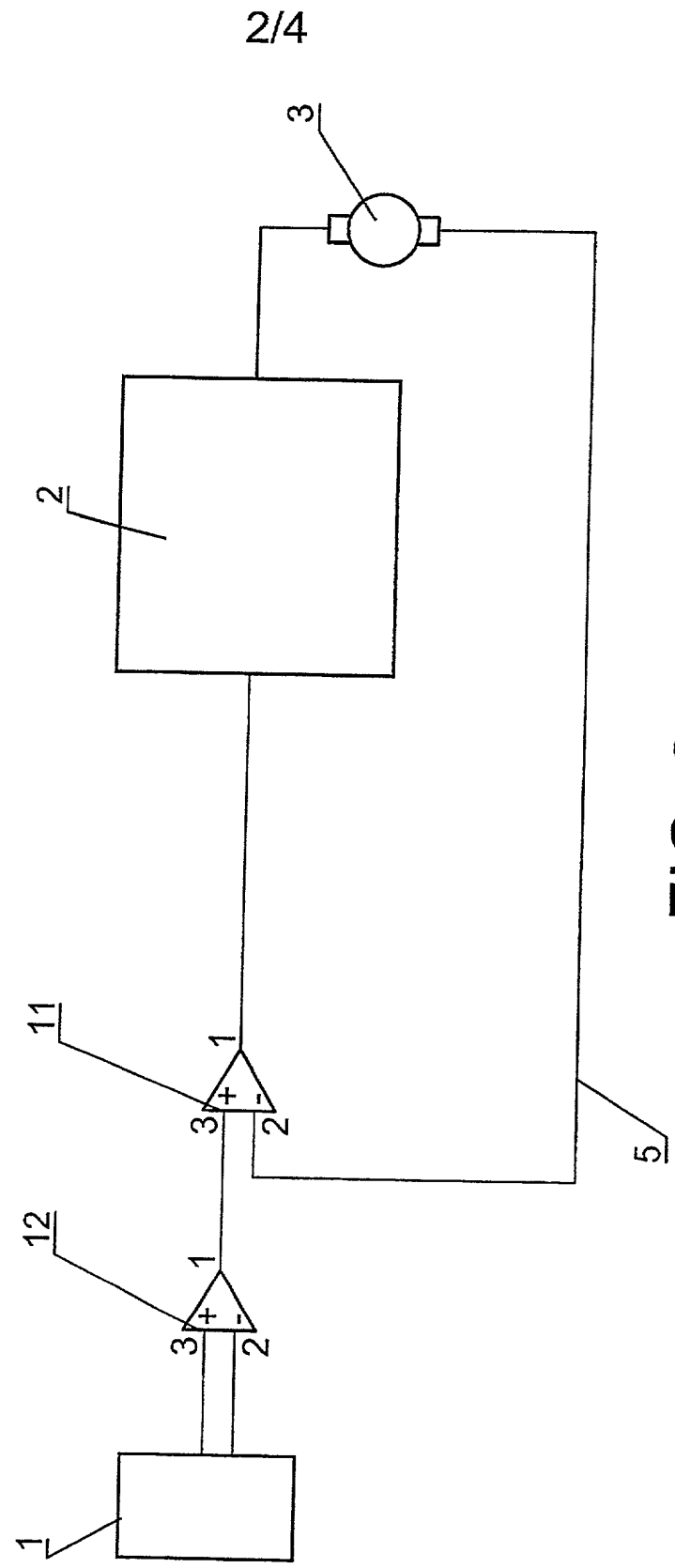


FIG. 2

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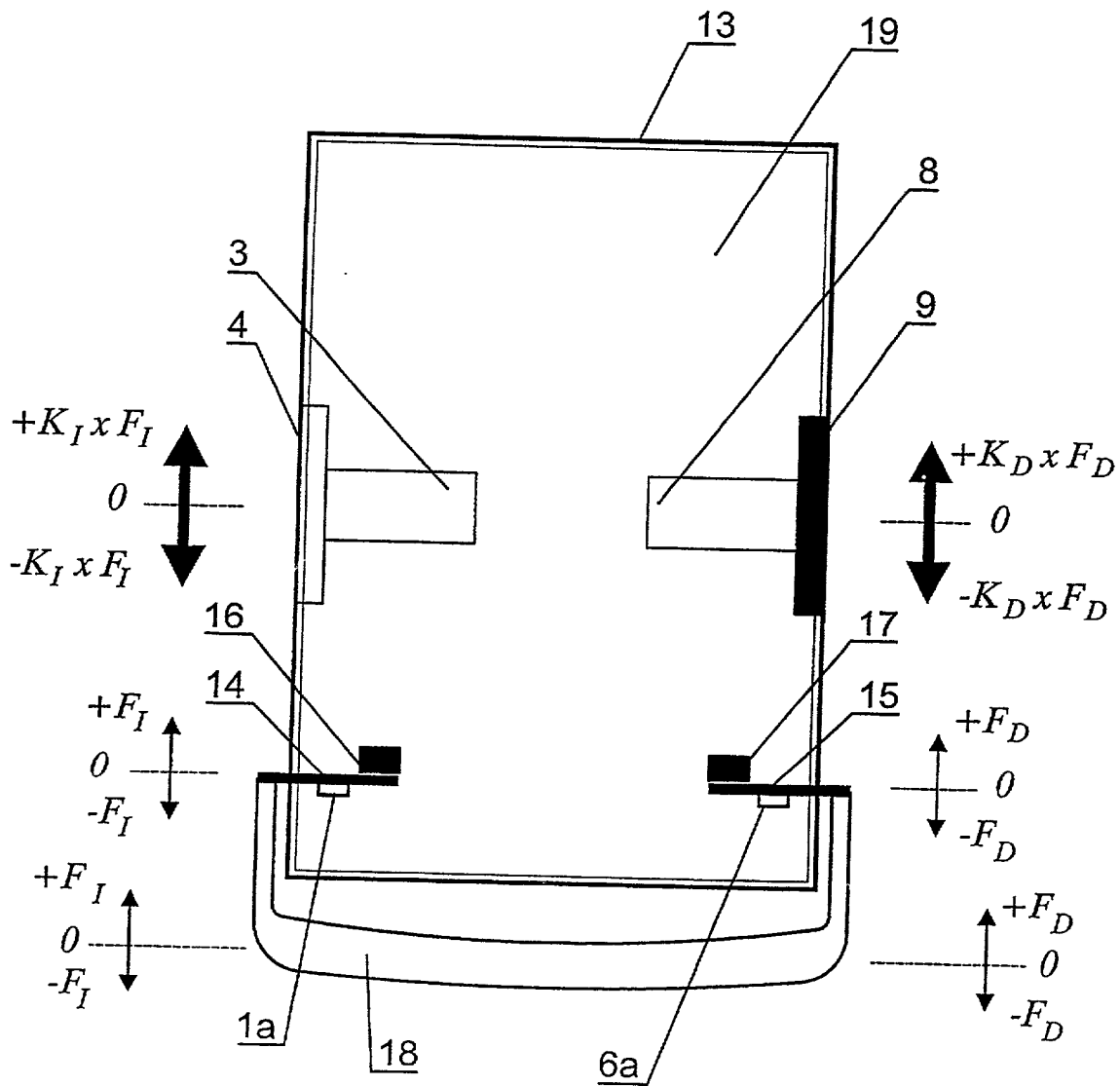


FIG. 3

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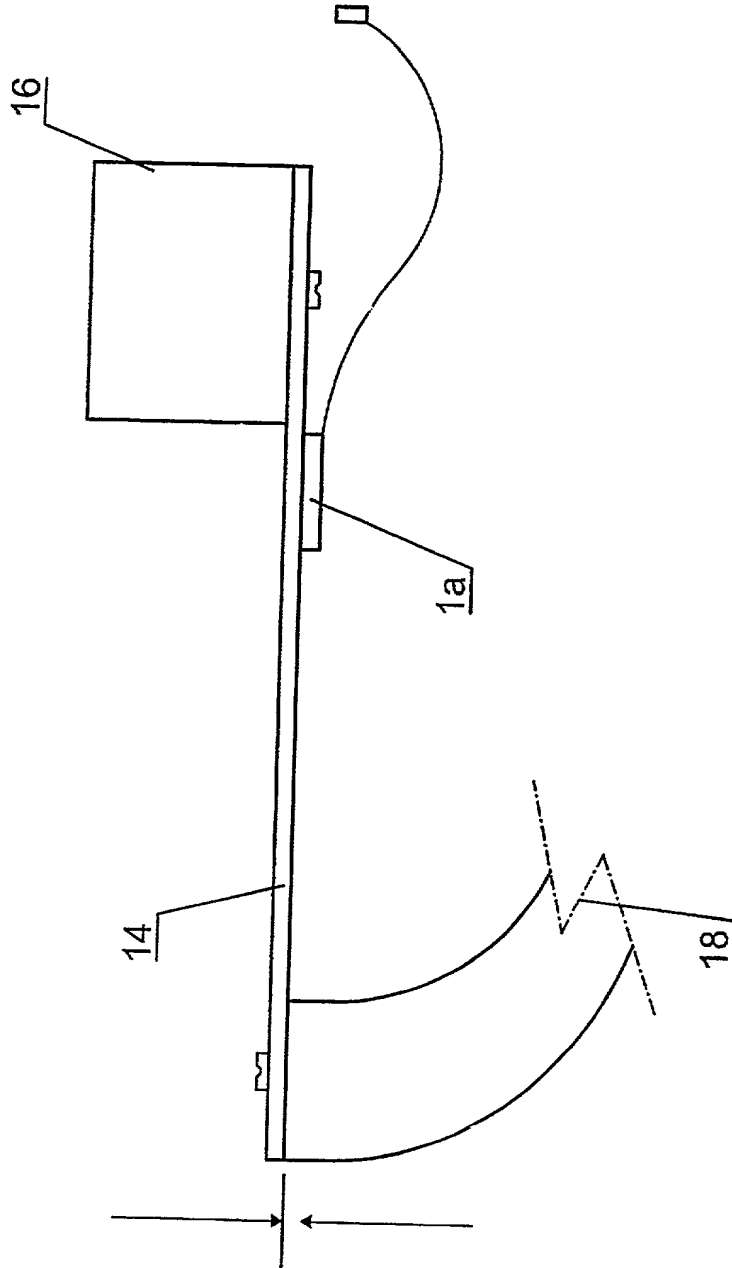


FIG. 4

**DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below under my name.

I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

SYSTEM FOR CONTROLLING ELECTRIC MOTORS USED FOR THE PROPULSION  
OF A TRANSPORT TROLLEY

the Specification of which

☐ is attached hereto  
☒ was filed on November 24, 1999  
as International Application No. PCT/ES99/00381

I hereby state that I have reviewed and understand the contents of the above-identified Specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 (a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

**PRIOR FOREIGN FILED APPLICATION(S)**

<u>APPLICATION</u> <u>NUMBER</u>	<u>COUNTRY</u>	<u>(MONTH/DAY/YYYY)</u>	<u>PRIORITY</u> <u>CLAIMED</u>
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P 9802534	SPAIN	November/28/1998	YES
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I hereby claim the benefit under Title 35, United States Code §119(e) of any United States provisional application(s) listed below.

**APPLICATION NUMBER(S)**

**FILING DATE (MM/DD/YYYY)**

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s), or §365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this

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application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent	PCT Parent	Parent Filing	Parent Patent
<u>Application No.</u>	<u>Number</u>	<u>(MM/DD/YYYY)</u>	<u>Number (if applicable)</u>

The undersigned hereby authorizes the U.S. attorney or agent named herein to accept and follow instructions from **UNGRIA PATENTES Y MARCAS, S.A.** as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorney or agent and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorney or agent named herein will be so notified by the undersigned.

I hereby appoint as my attorneys or agents the registered persons identified under

**Customer No. 23565**

for the law firm of Klauber & Jackson, said attorneys or agents with full power of substitution and revocation to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

Please address all correspondence regarding this application to **Customer No. 23565**.

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Direct all telephone calls to David A. Jackson at (201) 487-5800.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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DATE 23-07-01

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